

ABSTRACT

The present invention provides a compact tablet storage and take-out apparatus capable of quickly discharging and filing tablets. The tablet storage and take-out apparatus includes: a cylindrical drum; drum driving means; a plurality of tablet cassette mounting bases (341) which are fitted to an outer surface of the drum; tablet cassettes which are detachably mounted on the tablet cassette mounting bases; and a guide passage which guides inside the drum tablets discharged from the tablet cassettes. Moreover, the apparatus includes: a transfer robot which is provided inside the drum so as to be liftable and also rotatable, and which transfers the vial held by arms between a delivery position located outside an opening formed in an upper end or a lower end of the drum and a tablet filling position where the tablets discharged through the guide passage are filled. The position of at least one of the drum and the transfer robot is controlled so that an opening of the vial held by the transfer robot agrees with an outlet of the guide passage.

FIG.6

1. Operation display panel
2. Vial supply part
 - Rotation driving device
 - Bottle detection sensor
 - Position detection sensor
3. Labeling part
4. Tablet supply part (Drum)
 - Tablet detection sensor
 - Rotation driving device
5. Cassette identification sensor
 - Tablet detection sensor
 - Rotation driving device
6. Tablet supply part (motor base)
7. Bottle detection sensor
 - Inversion driving device
 - Rotation driving device
 - Discharge driving device
8. Cap supply part
9. Parallel moving device
 - Push-up driving device
 - Rotation driving device
 - Position detection sensor
 - Cover detection sensor
10. Capping part
11. Bottle detection sensor
12. Storage part

13. Host computer
14. PC (Device control application)
15. Device controller
16. Photographing part
17. Digital camera
18. First transfer robot
19. Position detection sensor
 - Elevation driving device
 - Parallel moving device
 - Arm driving device
20. Second transfer robot
21. Elevation driving device
 - Arm driving device
 - Oscillation driving device
 - Extension-Contraction driving device
 - Rotational driving device
 - Position detection sensor
 - Bottle detection sensor
22. Third transfer robot
23. Fourth transfer robot

FIG.24

1. Second robot arm
2. Start
3. Move to delivery position

- Vial detected?
- Extend arm boom
- Located at holding position?
- Stop extension of arm boom
- Hold vial
- Contract arm boom
- Located at origin
- Take-out coordinates received?
- Lifting and rotational movement
- Arm base at tilt position
- Take-out coordinates reached?
- Extend arm boom
- Take-out position reached?
- Standby for filling period
- 4. Remaining tablets dropping operation
- 5. Oscillating operation
- 6. Tablets tend to remain?
- 7. Filled amount 65% or more?
- 8. Arm base at horizontal position
- Move to delivery position
- Delivered?

FIG.25

- 1. Mutual control
- 2. Start

Take-out coordinates received
Detect current drum coordinates
Detect current arm rotational coordinates of second transfer robot
Determine rotation directions within rotation limits
Estimate coordinates of intersection of drum coordinates and arm
rotational coordinates
Rotate drum
Rotate second transfer robot
Coordinates of intersection reached?
Stop both rotations

FIG.26

1. Drum control
2. Take-out coordinates reached?
Stop drum rotation

FIG.27

1. Robot arm control
2. Stop rotation of second transfer robot

FIG.32

1. Double drum
2. To flow of any one of
Robot arm control
Drum control

Mutual control

3. Outer drum?

- Detect current coordinates of outer drum
- Detect current coordinates of inner drum
- Determine rotation directions within rotation limits
- Estimate intersection coordinates of outer drum and inner drum
- Rotate outer and inner drums
- Intersection coordinates reached?
- Stop outer and inner drums

FIG.33

- 1. Auxiliary transfer robot
- 2. Outer drum take-out coordinates received.

- Standby at delivery position
- Vial arrived?
- Extend arm boom
- Hold viral
- Contract arm boom and swivel
- Elevating base

FIG.36

- 1. Third robot arm
- 2. Start

- Move to first delivery position
- Vial empty?

Vial detected?
Hold vial
Move to second delivery position
Transmit photographing permission signal
Photographing completion signal received?
Move to third delivery position
Delivery to capping part
Release arm
Standby at current position
Cap fitting completion signal?
Hold vial
Move to fourth delivery position
Delivered?

FIG.37

1. Photographing initialization
2. Start

Main body turned ON?
Turn On PC
Activate device control application
Transmit initialization signal
Obtain initial origin of each device
Turn ON camera
Make initial zoom setting
3. Select image size

Define image quality
Set flash
Color balance
Receive initialization completion signal

FIG.38

1. Photographing control
2. Start

Photographing permission signal received?
Auto-focus detection
Focus control
Photographing signal
Access photographing image file
Transfer and temporality save data
Monitor display
Manual check ON?
3. Clear temporary data
4. Image saving permission operated?

Transmit photographing end signal

FIG.39

1. Photographing part 400
2. Device controller 802
3. At initial process
4. Activate vial application

5. Transmit initialization data
6. Initialize camera
7. Turned power ON or designate initialization
8. Initialize each device and wait for packing data
9. At packing process
10. Transmit packing designation
11. Designate photographing with camera
12. Save image
13. Transmit photographing completion
14. Photographing with camera
15. Transmit camera image
16. Packing processing
17. Photographing position
18. To the next process
19. At ending processing
20. End vial application
21. Camera closing processing
22. Turn power OFF

FIG.40

1. Photo display upon packing completion
2. COMPLETE screen
3. Notify packing completion
4. Notification of pickup
5. Pickup confirmation screen

6. Enlarged photo screen
7. Designate photo enlargement
8. Complete packing
9. Bottle to dispensing window
10. Blink corresponding 7SEG
11. Confirm pickup operation
12. Read prescription bar code
13. Pickup bottle
14. Confirm prescription details
15. Photo display after packing completion confirmation
16. PHOTO list screen
17. Photo screen
18. PHOTO list screen
- Designate prescription
19. Read in bar code of dispensed bottle label.

FIG.42

1. Pyrazolone tablets with external tablet supply part
2. Start
 Prescription data received.
 External tablet supply part designated?
 Tablet cassette detected?
 Discharge tablets
 Select vial size
 Create print data

Transmit data
Transfer vial by first transfer robot
Printing and labeling by labeling part
Transfer vial by first transfer robot
Transfer vial by third transfer robot
Transfer vial by fourth transfer robot
Vial taken out?
Tablets filled?
Photographing to be omitted?
Clear stored data
Confirm details with naked eyes
Take out cap from external cap storage part and perform plugging
3. Normal control
4. Photographing button?
Standby vial to be returned?
Third transfer robot/fourth transfer robot empty?
Interrupt processing
Transfer by third transfer robot/fourth transfer robot
Moved to photographing position?
Photographing completed?
Transfer by third transfer robot
Transfer by fourth transfer robot
Vial taken out?

FIG.43 0.0 Main menu

FIG.44	1.0 Automatic dispensing screen
FIG.45	1.1 In-process prescription list screen
FIG.46	1.1.1 Vial take-out error confirmation screen
FIG.47	1.1.1.1 Vial interior photo display device
FIG.48	1.2 Drug filling cassette specification screen
FIG.49	1.2.1a New drug registration screen
FIG.50	1.2.1a Drug list display screen
FIG.51	1.2.1a.1 NDC master drug delete screen
FIG.52	1.2.1b NDC code check screen
FIG.53	1.2.1b.1 Tablet filling screen
FIG.54	1.2.1b.1.1 Filling confirmation screen
FIG.55	1.2.2 Cassette list screen
FIG.56	1.2.3 Cassette-by-cassette tablet inventory list screen
FIG.57	1.2.3.1 Tablet inventory change screen
FIG.58	1.3 Processed prescription list screen
FIG.59	1.4 Filling history drug selection screen
FIG.60	1.4.1 Filling history display screen
FIG.61	1.5 Dispensing machine not-yet-transmitted prescription list screen
FIG.62	1.6 Dispensed vial photo list screen
FIG.63	1.6.1 Photo display screen
FIG.64	1.7 Manual dispensing cassette designation screen
FIG.65	1.7.1 Manual dispensed tablet quantity designation screen
FIG.66	1.7.2 Cassette list screen
FIG.67	2.0 Drug table list screen

- FIG.68** 2.1 Deleted drug confirmation screen
- FIG.69** 3.0 Tablet cassette control screen
- FIG.70** 4.0 Host disconnection screen
- FIG.71** 5.0 Date update time setting screen
- FIG.72** 5.1 Program version information display screen